UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/814,853	03/30/2004	Qinghua Li	111027-172835	5604

31817 7590 07/20/2010
SCHWABE, WILLIAMSON & WYATT, P.C.
PACWEST CENTER, SUITE 1900
1211 S.W. FIFTH AVE.
PORTLAND, OR 97204

EXAMINER	
MERED, HABTE	

ART UNIT	PAPER NUMBER
2474	

MAIL DATE	DELIVERY MODE
07/20/2010	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	**Application No.** 10/814,853	**Applicant(s)** LI ET AL.	
	Examiner HABTE MERED	**Art Unit** 2474	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *03 May 2010*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *27-31 and 33-47* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *27-31 and 33-47* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application

6) ☐ Other: _____.

DETAILED ACTION

Response to Amendment

1. The amendment filed on 5/3/2010 has been entered and fully considered.

2. Claims 1-26 were previously cancelled. Claims 27-31 and 33-47 are currently pending. The base independent claims are 27, 35, 40, and 44. All independent claims and dependent claim 45 are amended.

3. The Information Disclosure Statement (IDS) submitted on 5/3/10 has been fully considered.

Response to Arguments

4. Applicant's arguments filed on 5/3/2010 with respect to amended claims 27-31 and 33-47 have been fully considered but they are not persuasive.

5. First Applicant argues with respect to claim 1 but claim 1 is cancelled. Examiner assumes Applicant is referring to claim 27 and not claim 1.

6. In the Remarks starting from the last paragraph of page 7 to the first two paragraphs of page 8, Applicant argues with respect to independent claim 27, that Shattil'027 fails to disclose the amended limitation of separating with a spatial demapper the plurality of SDMA data streams in the frequency domain into separated plurality of data streams in the frequency domain. Applicant challenges Shattil'027 demapper 225

in Fig. 2B does not meet the requirement in the limitation in question and cites paragraphs 100, 141, and 139 and indicates the Figure cited by Examiner, Fig. 4J does not teach the limitation in question.

Examiner's Response: Examiner respectfully disagrees with Applicant's analysis and conclusions.

First there is no question that Shattil'027 system supports SDMA signals and space division multiple access applications as inferred in paragraphs 37, 45, 138, and 192.

Second the demapper 225 in Fig. 2B appears after the FFT 223 which converts the received signal Rx 221 in time domain and converts it into frequency signal in the frequency domain and into separate data streams in the frequency domain as suggested in paragraph 94. Further the output of data streams is fed to the demapper 225 and after rearranging the appropriate phase signals will be merged in the frequency domain before converting to time domain as shown in Fig. 4J. Effectively demapper 225 is represented by elements 470.1 and 470.2.in Fig. 4J. In Fig. 4J <u>the received signal, Rx 461, is converted into several data stream in the frequency domain and then each data stream is further separated into numerous data streams by phase shifting it and finally combining it for transformation in time domain</u>.

Hence the received signal Rx 461as called in the limitation is converted to N frequency domain components as output of FFT 472 and each component is further separated into a plurality of streams in the frequency domain by phase

shifting each component as shown in Fig. 4J. Therefore Shattil'027 meets the limitation in question clearly. *Applicant may need to consider how the signals are separated in the frequency domain to overcome the cited prior art because it appears to the Examiner that in the Applicant case the signals are demultiplexed and never combined in the frequency domain.*

7. Applicant, beginning the last paragraph of page 8 and the entire page 9 of the Remarks, argues with respect to claim 27 that the FFT 472 in Fig. 4J and the DFTs in Figure 10B do the signal separation based on the orthonormal basis of the transmitted signals and not based on the channel matrix as currently amended.

Examiner's Response:

First separation on a channel matrix cannot be novel because channel matrix is a basic operation in Fourier Transforms. In fact Applicant specification agrees with Examiner's position in that it defines channel matrix as an SDMA QxP channel matrix known to those of skill in the art in paragraph 30 of the unpublished version of the specification. The specification states in the same paragraph Q stands for the plurality of Antennas and P is the plurality of users. *How the antennas are represented in the matrix is not defined. Any property of the antennas reflected for all Q antennas and P data streams for P users in a QxP matrix qualifies as a channel matrix. Given such clarification definitely both Ogawa'308 and Shattil'027 do teach channel matrix.*

Ogawa'308 in paragraphs 21, 24, and 155 shows h is the coefficient of a signal from a specific user at a specific antenna and is represented by H matrix for all

antennas channel response in equation 7 or a matrix in equation 24 is equivalent to Applicants Q matrix. Equation 23 Q matrix actually is the P asynchronous user's data matrix. Equation 25 shows the channel matrix as Qa which effectively is Applicant's QXP.

Shattil'027 teaches a channel matrix as a product matrix shown in Fig. 5B. The NxN code matrix represents the N antennas with N frequencies multiplied by d1....dN data user streams give the weight product matrix of N antennas X d users data streams equivalent to Applicant channel matrix of Q antennas X P user streams. See Paragraphs 145-147 and 148.

Shattil'027 uses the channel matrix as shown in Fig. 6B. Applicant clearly needs to explain how the Q antennas and P user streams are represented in the QxP matrix to have a novel channel matrix. It should be noted that what is really at least claimed in the independent claims is even a broader definition of channel matrix simply being a representative of a channel response for each of a plurality of channels. The fact that Shattil'027 in addition uses the orthogonally of the signals to separate unwanted signals is irrelevant as it is an added advantage to minimize interference.

Claim Rejections - 35 USC § 103

8. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the

> invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

9. **Claims 27-28, 31, 33-39, and 47** are rejected under 35 U.S.C. 103(a) as being unpatentable over Ogawa et al (Japanese Patent Application Number 2001-319308) in view of Shatil (US Pub No. 2004/0086027 A1) and Priotti (US Pub. No. 20040120410).

Regarding **claim 27**, Ogawa'308 discloses a method comprising:

computing, by a wireless access point **(Drawing 1 – base station 1000 paragraph 112)**, a channel matrix that is representative of a channel **(Equation 25 shows the channel matrix as Qa which effectively is Applicant's QXP response)** for each of a plurality of channels, said computing based at least in part on training signals **(See Drawing 3 – training signals paragraphs 14, 101, 105 and 115)** received over two or more antennas from multiple stations **(See Drawing 1 - antennas 1 to n – Also Ogawa'308 in paragraphs 21, 24, and 155 shows h is the coefficient of a signal from a specific user at a specific antenna and is represented by H matrix for all antennas channel response in equation 7 or a matrix in equation 24 is equivalent to Applicants Q matrix. Equation 23 Q matrix actually is the P asynchronous user's data matrix. Equation 25 shows the channel matrix as Qa which effectively is Applicant's QXP.)**;

receiving from multiple stations **(See paragraphs 20-24)** at the wireless access point a plurality of up linked spatial division multiple access (SDMA) data streams **(i.e. Drawing 2 SDMA Base Station receives uplink SDMA data streams from mobile**

elements) that are out of synchronism by a time period greater than an allowed guard band time period **(i.e. delayed wave of desired signal is received and is distinguished as long or short delay based on guard band as shown in Drawings 4 and 5 – see paragraphs 124 and 139)**.

Ogawa'308 fails to expressively disclose converting the plurality of SDMA data streams from a first time domain to a frequency domain. However Ogawa'308 shows in Fig.1 that the received signal is converted into frequency domain in Drawings 1 and 11c.

Ogawa'308 also fails to discloses separating with a spatial de-mapper the plurality of SDMA data streams <u>in the frequency domain</u> into a separated plurality of data streams in the frequency domain based <u>at least in part</u> on the channel <u>matrix</u>; converting the separated plurality of data streams from the frequency domain to a second time domain.

However, the above mentioned claimed limitations are well known in the art as evidenced by Shattil'027.

In particular, Shattil'027 discloses converting the plurality of SDMA data streams **(see paragraphs 37, 45, 138, and 192 indicating the data streams can be SDMA based)** from a first time domain to a frequency domain **(In Figures 4J and 10B, the asynchronous signals Rx are directly fed to and FFT or DFT to convert each of the Rx asynchronous composite signals from time domain to frequency domain as further detailed in paragraphs 141 and 186)**;

separating with a spatial de-mapper **(see Fig. 2 element 225 and can be a spatial demapper if the signals are SDMA as suggested in paragraph 27 and is further represented as elements 470.1 and 474.1 in Fig. 4J)** the plurality of SDMA data streams <u>in the frequency domain</u> **(see output of 470.1 with many data streams after phase shifting in Fig. 4J)** into a separated plurality of data streams in the frequency domain **(In Figure 4J and 10B 1 ...M composite asynchronous Rx signals are separated into N data streams in the frequency domain and each component of the N data stream is further separated into a plurality of data streams in frequency domain by 470.1 in Fig. 4J and for further illustration see paragraphs 141,142, 186, and 187)** based on the <u>channel Matrix</u> **(Shattil'027 teaches a channel matrix as a product matrix shown in Fig. 5B. The NxN code matrix represents the N antennas with N frequencies multiplied by d1....dN data user streams give the weight product matrix of N antennas X d users data streams equivalent to Applicant channel matrix of Q antennas X P user streams. See Paragraphs 145-147 and 148. see also paragraphs 191 and 192 for using channel response)**;

converting the separated plurality of data streams from the frequency domain to a second time domain **(it should be noted that Shattir027 teaches a second time domain as the output of Figure 4J's 462 is M data streams in the time domain as the combiners and integrators serve as an IFFT as illustrated in paragraphs 142 and 193).**

In view of the above, having the method of Ogawa'308 and then given the well established teaching of Shattil'027, it would have been obvious to one having ordinary

skill in the art at the time of the invention was made to modify the method of Ogawa'308 as taught by Shattil'027, since Shattil'027 clearly states in paragraphs 32 and 33 that the modification results in a CI transceiver that uses time domain signal shaping resulting in a peak to average power ratio.

Ogawa'308 also fails to disclose a method of synchronizing the separated plurality of data streams in the second time domain.

However, the above mentioned claimed limitations are well known in the art as evidenced by Priotti'410.

In particular, Priotti'410 discloses a method of synchronizing the separated pluralities of data streams in a second time domain **(See Paragraph 43 and Figure 1, element 116. It should be noted here that neither a receiver nor a transmitter is claimed and hence element 116 of Figure 1 can be considered a second time domain synchronization taking into consideration the first time domain conversion at the transmitter. Never the less, Priotti'410 clearly teaches synchronization in the second time domain in the receiver 106 of the wireless system of Figure 1. The first time synchronization occurs in element 116 of Figure 1. The second time synchronization occurs in the second time domain in Figure 1, element 130. See paragraphs 52, 142, and 193).**

In view of the above, having the method of Ogawa'308 and then given the well established teaching of Priotti'410, it would have been obvious to one having ordinary skill in the art at the time of the invention was made to modify the method of Ogawa'308 as taught by Priotti'410, since Priotti'410 clearly states in paragraph 8, Lines 1-5 that

such a modification will allow post-FFT correction of fine frequency offset providing a much more accurate and enhanced synchronization at the receiver.

Regarding **claim 28**, the combination of Ogawa'308, Shattil'027, and Priotti'410 disclose a method wherein the receiving comprises: receiving at least some of the plurality of SDMA data streams as data streams that include a plurality of non-aligned orthogonal frequency division multiplexed symbols **(See Shattil'027 paragraph 213 received OFDM symbols can be non-aligned requiring synchronization at the receiver)**.

Regarding **claim 31**, the combination of Ogawa'308, Shattil'027, and Priotti'410 disclose a method, wherein the separating comprises: separating the plurality of SDMA data streams using a channel matrix **(See Shattil'027's Figure 5B, 6B, and 11 and paragraphs 145 and 156)**.

Regarding **claim 33**, the combination of Ogawa'308, Shattil'027, and Priotti'410 disclose a method wherein the separating comprises: separating the plurality of SDMA data streams into a separated plurality of data streams, wherein at least some of the separated plurality of data streams have different frequency offsets **(Shattil'027 shows in Fig 3E different frequency offsets and besides if the signals did not have frequency offsets then it will be hard to distinguish them in the frequency domain)**.

Regarding **claim 34**, the combination of Ogawa'308, Shattil'027, and Priotti'410 disclose a method wherein a number of the separated plurality of data

streams correspond to a like number of wireless channels **(Shattil'027 shows in paragraph 37 that the wireless channel is shared and divided in sub-carrier or sub-channel using OFDM/SDMA techniques)**.

Regarding **claim 35**, Ogawa'308 discloses an article comprising a memory has instructions stored thereon, wherein the instructions, when executed, cause the processor to perform:

computing, by a wireless access point **(Drawing 1 – base station 1000 paragraph 112)**, a channel response for each of a plurality of channels based on training signals **(See Drawing 3 – training signals paragraphs 14, 101, 105 and 115)** received over two or more antennas from multiple stations **(See Drawing 1 - antennas 1 to n)**, the computed channel response includes at least a channel matrix **(Also Ogawa'308 in paragraphs 21, 24, and 155 shows h is the coefficient of a signal from a specific user at a specific antenna and is represented by H matrix for all antennas channel response in equation 7 or a matrix in equation 24 is equivalent to Applicants Q matrix. Equation 23 Q matrix actually is the P asynchronous user's data matrix. Equation 25 shows the channel matrix as Qa which effectively is Applicant's QXP.)**;

converting a plurality of spatial division multiple access (SDMA) data streams **(i.e. Drawing 2 SDMA Base Station receives uplink SDMA data streams from mobile elements)** from a first time domain **(note when received at the base station of drawing 2 it is in first time domain as it comes out from the mobiles)** to a frequency domain **(i.e. Drawing 2 FFT units 1020 output is frequency domain)** after

the plurality of SDMA data streams have been received as a plurality of uplinked SDMA data streams **(See paragraphs 20-24)** that are out of synchronism by a time period greater than an allowed guard band time period **(i.e. delayed wave of desired signal is received and is distinguished as long or short delay based on guard band as shown in Drawings 4 and 5 – see paragraphs 124 and 139)**.

Ogawa'308 fails to expressively disclose separating the plurality of SDMA data streams in the frequency domain into a separated plurality of data streams in the frequency domain based on the channel matrix. However Ogawa'308 shows such functionality in Drawing 1.

Ogawa'308 also fails to disclose converting the separated plurality of data streams from the frequency domain to a second time domain.

However, the above mentioned claimed limitations are well known in the art as evidenced by Shattil'027.

In particular, Shattil'027 discloses separating the plurality of SDMA data streams in the frequency domain **(see output of 470.1 with many data streams after phase shifting in Fig. 4J)** into a separated plurality of data streams in the frequency domain**(i.e. Figure 10B DFT 1071 or Figure 4J FFT 472 separate SDMA data streams into plurality of streams in the frequency domain - see paragraphs 141,142, 186, and 187 and further the signal in the frequency domain is separated by element 470.1 in Fig. 4J)** based on the channel matrix **(Shattil'027 teaches a channel matrix as a product matrix shown in Fig. 5B. The NxN code matrix represents the N antennas with N frequencies multiplied by d1....dN data user streams give the weight**

product matrix of N antennas X d users data streams equivalent to Applicant channel matrix of Q antennas X P user streams. See Paragraphs 145-147 and 148. see also paragraphs 191 and 192 for using channel response);

converting the separated plurality of data streams from the frequency domain to a second time domain **(it should be noted that Shattir027 teaches a second time domain as the output of Figure 4J's 462 is M data streams in the time domain as the combiners and integrators serve as an IFFT as illustrated in paragraphs 142 and 193)**.

In view of the above, having the article of Ogawa'308 and then given the well established teaching of Shattil'027, it would have been obvious to one having ordinary skill in the art at the time of the invention was made to modify the article of Perahia'718 as taught by Shattil'027, since Shattil'027 clearly states in paragraphs 32 and 33 that the modification results in a CI transceiver that uses time domain signal shaping resulting in a peak to average power ratio.

Ogawa'308 also fails to disclose synchronizing the separated plurality of data streams in the second time domain.

However, the above mentioned claimed limitations are well known in the art as evidenced by Priotti'410.

In particular, Priotti'410 discloses synchronizing the separated pluralities of data streams in a second time domain **(See Paragraph 43 and Figure 1, element 116. It should be noted here that neither a receiver nor a transmitter is claimed and hence element 116 of Figure 1 can be considered a second time domain**

synchronization taking into consideration the first time domain conversion at the transmitter. Never the less, Priotti'410 clearly teaches synchronization in the second time domain in the receiver 106 of the wireless system of Figure 1. The first time synchronization occurs in element 116 of Figure 1. The second time synchronization occurs in the second time domain in Figure 1, element 130. See paragraphs 52, 142, and 193).

In view of the above, having the article of Ogawa'308 and then given the well established teaching of Priotti'410, it would have been obvious to one having ordinary skill in the art at the time of the invention was made to modify the article of Ogawa'308 as taught by Priotti'410, since Priotti'410 clearly states in paragraph 8, Lines 1-5 that such a modification will allow post-FFT correction of fine frequency offset providing a much more accurate and enhanced synchronization at the receiver.

Regarding **claim 36**, Ogawa'308 discloses an article, wherein the separating comprises: separating the plurality of SDMA data streams at a wireless access point **(See Drawing 1, Base Station and the BS as a receiver in Drawing 2 and In Drawing 1 separating the SDMA data streams)**.

Regarding **claim 37**, the combination of Ogawa'308, Shattil'027, and Priotti'410 discloses an article wherein the instructions, when executed, cause the processor to perform: computing a frequency response for a plurality of channels corresponding in number to a number of the plurality of SDMA data streams **(See**

Shattil'027 paragraph 192 calculation of the channel response for the nth frequency channel).

Regarding **claim 38**, the combination of Ogawa’308, Shattil'027, and Priotti'410 discloses an article, wherein the synchronizing comprises: synchronizing at least one of the separated plurality of data streams after detecting a boundary between preambles. **(See Ogawa'308 Fig. 5 alignment method).**

Regarding **claim 39**, the combination of Ogawa'308, Shattil'027, and Priotti'410 discloses an article, wherein the instructions, when executed, cause the processor to perform: estimating a coarse frequency offset between receiver and transmitter oscillator clocks **(Priotti'410 in paragraph 64 teaches large or coarse frequency offset estimation and in paragraph 65 it teaches smooth frequency offset estimation)**.

Regarding **claim 47**, the combination of Ogawa'308, Shattil'027, and Priotti'410 disclose a method, wherein at least two of the plurality of uplinked SDMA data streams are out of synchronism greater than 0.8 microseconds. **(See Ogawa'308 in Drawings 2, 4-5 showing receiving within and outside guard band and Priotti'410 discloses the guard band for 802.11a/SDMA system is 0.8 microsecond in paragraph 60).**

10. **Claims 29 and 30** are rejected under 35 U.S.C. 103(a) as being unpatentable over Ogawa'308 in view of Shattil'027 and Priotti'410 as applied to claim 27 above, and further in view of Perahia et al (US 7, 352, 718 B1).

Regarding **claim 29**, the combination of Ogawa'308, Shattil'027 and Priotti'410 fails to disclose a method wherein the receiving comprises: receiving the plurality of SDMA data streams in response to a polling communication.

Perahia'718 discloses a method wherein the receiving comprises: receiving the plurality of SDMA data streams in response to a polling communication. **(See Perahia'718 Column 3, Lines 25-30)**.

In view of the above, having the method based on the combination of Ogawa'308, Shattil'027 and Priotti'410 and then given the well established teaching of Perahia'718, it would have been obvious to one having ordinary skill in the art at the time of the invention was made to modify the method based on the combination of Ogawa'308, Shattil'027 and Priotti'410 as taught by Perahia'718, since Perahia'718 clearly states in Column 2, Lines 10-15 that the modification results in allowing for simultaneous transmissions by multiple users and increased system capacity.

Regarding **claim 30**, the combination of Ogawa'308, Shattil'027, Priotti'410 and Perahia'718 discloses a method wherein the polling communication comprises multiple polling messages overlapping in time and corresponding in number to the multiple stations **(See Perahia'718 Column 7, Lines 13-23 and Fig. 6 showing multiple**

polling messages to multiple stations in overlapping time eventually leading to failure of packet reception).

11. **Claims 40 and 42-46** are rejected under 35 U.S.C.103(a) as being unpatentable over Perahia'718 in view of Shattil'027 and Priotti'410.

Regarding **claim 40**, Perahia'718 discloses an apparatus **(i.e. Figure 1, element 102 - SDMA AP)** wherein the plurality of SDMA data streams **(i.e. sourced by Figure 1, elements 104 SDMA stations)** have been received as a plurality of uplinked SDMA data streams **(i.e. Fig. 1 SDMA AP 102 receives uplink SDMA data streams from elements 104 as detailed in Column 5, Lines 1-5)** that are out of synchronism by a time period greater than an allowed guard band time period **(i.e. the allowed guard band time is shown in Figs. 7 &8 and shows in Column 9, Lines 50-55 that the uplink transmission can be out of synch which has to exceed the guard band time)**.

Perahia'718 fails to disclose an apparatus including a separation module to separate a plurality of spatial division multiple access (SDMA) data streams into a plurality of separated data streams, in a frequency domain, after the plurality of SDMA data streams have been converted from a first time domain to the frequency domain, <u>wherein the separation module is configured to separate the plurality of SDMA data streams in the frequency domain based at least in part on a channel matrix.</u>

However, the above mentioned claimed limitations are well known in the art as evidenced by Shattil'027. In particular, Shattil'027 discloses an apparatus including a separation module **(i.e. Figure 10B DFT 1071 or Figure 4J FFT 472 +470.1)** to separate a plurality of spatial division multiple access (SDMA) data streams into a plurality of separated data streams, in a frequency domain **(i.e. the signal in frequency domain further divided into many data streams based on phase shift in element 470.1 of Fig. 4J)**, after the plurality of SDMA data streams have been converted from a first time domain to the frequency domain. **(In Figures 4J and 10B, the asynchronous signals Rx are directly fed to and FFT or DFT to convert each of the Rx asynchronous composite signals from time domain to frequency domain as further detailed in paragraphs 141, 142, 186 and 187)** wherein the separation module **(Figure 4J FFT 472 +470.1)**is configured to separate the plurality of SDMA data streams in the frequency domain **(see output of 470.1 with many data streams after phase shifting in Fig. 4J)**based at least in part on a channel matrix**(Shattil'027 teaches a channel matrix as a product matrix shown in Fig. 5B. The NxN code matrix represents the N antennas with N frequencies multiplied by d1....dN data user streams give the weight product matrix of N antennas X d users data streams equivalent to Applicant channel matrix of Q antennas X P user streams. See Paragraphs 145-147 and 148. see also paragraphs 191 and 192 for using channel response).**

In view of the above, having the apparatus of Perahia'718 and then given the well established teaching of Shattil'027, it would have been obvious to one having

ordinary skill in the art at the time of the invention was made to modify the apparatus of Perahia'718 as taught by Shattil'027, since Shattil'027 clearly states in paragraphs 32 and 33 that the modification results in a CI transceiver that uses time domain signal shaping resulting in a peak to average power ratio.

Perahia'718 also fails to disclose a synchronization module to synchronize the separated plurality of data streams in a second time domain after the separated plurality of data streams have been converted from the frequency domain to the second time domain.

However, the above mentioned claimed limitations are well known in the art as evidenced by Priotti'410. In particular, Priotti'410 discloses a synchronization module to synchronize the separated plurality of data streams in a second time domain after the separated plurality of data streams have been converted from the frequency domain to the second time domain. **(See Paragraph 43 and Figure 1, element 116. It should be noted here that neither a receiver nor a transmitter is claimed and hence element 116 of Figure 1 can be considered a second time domain synchronization taking into consideration the first time domain conversion at the transmitter. Never the less, Priotti'410 clearly teaches synchronization in the second time domain in the receiver 106 of the wireless system of Figure 1. The first time synchronization occurs in element 116 of Figure 1. The second time synchronization occurs in the second time domain in Figure 1, element 130. See paragraphs 52, 142, and 193).**

In view of the above, having the apparatus of Perahia'718 and then given the well established teaching of Priotti'410, it would have been obvious to one having ordinary

skill in the art at the time of the invention was made to modify the apparatus of Perahia'718 as taught by Priotti'410, since Priotti'410 clearly states in paragraph 8, Lines 1-5 that such a modification will allow post-FFT correction of fine frequency offset providing a much more accurate and enhanced synchronization at the receiver.

Regarding **claim 42**, the combination of Perahia'718, Shattil'027, and Priotti'410 discloses an apparatus, wherein the separation module comprises: a module to perform a fast Fourier transform on the plurality of SDMA data streams **(See Shattil'027 Figure 4J FFT 472).**

Regarding **claim 43,** the combination of Perahia'718, Shattil'027, and Priotti'410 discloses an apparatus, wherein the separation module comprises: a module to perform an inverse fast Fourier transform on at least one of the separated plurality of data streams **(See Shattil'027 Figure 11 element 1106 is an IFFT).**

Regarding **claim 44**, Perahia'718 discloses a system **(i.e. Figure 1, element 102 - SDMA AP)** wherein the plurality of SDMA data streams **(i.e. sourced by Figure 1, elements 104 SDMA stations)** have been received as a plurality of uplinked SDMA data streams **(i.e. Fig. 1 SDMA AP 102 receives uplink SDMA data streams from elements 104 as detailed in Column 5, Lines 1-5)** that are out of synchronism by a time period greater than an allowed guard band time period **(i.e. the allowed guard band time is shown in Figs. 7 &8 and shows in Column 9, Lines 50-55 that the uplink transmission can be out of synch which has to exceed the guard band time)**; and

a wireless access point **(See Figure 2, element 102)** coupled to a plurality of antennas to receive the plurality of SDMA data streams **(See Column 5, Lines 1-5)**.

Perahia'718 fails to disclose a system including a separation module to separate a plurality of spatial division multiple access (SDMA) data streams into a plurality of separated data streams, in a frequency domain, after the plurality of SDMA data streams have been converted from a first time domain to the frequency domain, <u>wherein the separation module is configured to separate the plurality of SDMA data streams in the frequency domain based at least in part on a channel matrix.</u>

However, the above mentioned claimed limitations are well known in the art as evidenced by Shattil'027. In particular, Shattil'027 discloses an apparatus including a separation module **(i.e. Figure 10B DFT 1071 or Figure 4J FFT 472 +470.1)** to separate a plurality of spatial division multiple access (SDMA) data streams into a plurality of separated data streams, in a frequency domain **(i.e. the signal in frequency domain further divided into many data streams based on phase shift in element 470.1 of Fig. 4J)**, after the plurality of SDMA data streams have been converted from a first time domain to the frequency domain. **(In Figures 4J and 10B, the asynchronous signals Rx are directly fed to and FFT or DFT to convert each of the Rx asynchronous composite signals from time domain to frequency domain as further detailed in paragraphs 141, 142, 186 and 187)** <u>wherein the separation module</u> **(Figure 4J FFT 472 +470.1)**<u>is configured to separate the plurality of SDMA data streams in the frequency domain</u> **(see output of 470.1 with many data streams after phase shifting in Fig. 4J)**<u>based at least in part on a channel matrix</u>**(Shattil'027**

teaches a channel matrix as a product matrix shown in Fig. 5B. The NxN code matrix represents the N antennas with N frequencies multiplied by d1....dN data user streams give the weight product matrix of N antennas X d users data streams equivalent to Applicant channel matrix of Q antennas X P user streams. See Paragraphs 145-147 and 148. see also paragraphs 191 and 192 for using channel response).

In view of the above, having the system of Perahia'718 and then given the well established teaching of Shattil'027, it would have been obvious to one having ordinary skill in the art at the time of the invention was made to modify the system of Perahia'718 as taught by Shattil'027, since Shattil'027 clearly states in paragraphs 32 and 33 that the modification results in a CI transceiver that uses time domain signal shaping resulting in a peak to average power ratio.

Perahia'718 also fails to disclose a synchronization module to synchronize the separated plurality of data streams in a second time domain after the separated plurality of data streams have been converted from the frequency domain to the second time domain.

However, the above mentioned claimed limitations are well known in the art as evidenced by Priotti'410. In particular, Priotti'410 discloses a synchronization module to synchronize the separated plurality of data streams in a second time domain after the separated plurality of data streams have been converted from the frequency domain to the second time domain. **(See Paragraph 43 and Figure 1, element 116. It should be noted here that neither a receiver nor a transmitter is claimed and hence element**

116 of Figure 1 can be considered a second time domain synchronization taking into consideration the first time domain conversion at the transmitter. Never the less, Priotti'410 clearly teaches synchronization in the second time domain in the receiver 106 of the wireless system of Figure 1. The first time synchronization occurs in element 116 of Figure 1. The second time synchronization occurs in the second time domain in Figure 1, element 130. See paragraphs 52, 142, and 193).

In view of the above, having the system of Perahia'718 and then given the well established teaching of Priotti'410, it would have been obvious to one having ordinary skill in the art at the time of the invention was made to modify the system of Perahia'718 as taught by Priotti'410, since Priotti'410 clearly states in paragraph 8, Lines 1-5 that such a modification will allow post-FFT correction of fine frequency offset providing a much more accurate and enhanced synchronization at the receiver.

Regarding **claim 45**, the combination of Perahia'718, Shattil'027, and Priotti'410 disclose a system, wherein the channel matrix is QXP matrix **(Fig. 5B – weight/product matrix)** and the system further comprising

a processor **(Fig. 6B element 605)** to form the QXP channel matrix **(Fig. 5B – weight/product matrix),** where in the plurality of antennas comprise Q antennas and wherein the plurality of SDMA data streams comprise P data streams.**(Shattil'027 teaches a channel matrix as a product matrix shown in Fig. 5B. The NxN code matrix represents the N antennas with N frequencies multiplied by d1....dN data user streams give the weight product matrix of N antennas X d users data streams equivalent to Applicant channel matrix of Q antennas X P user streams.**

See Paragraphs 145-147 and 148. see also paragraphs 191 and 192 for using channel response; See Shattil'027's Figure 5B, 6B, and 11 and paragraphs 145 and 156).

Regarding **claim 46**, the combination of Perahia'718, Shattil'027 and Priotti'410 disclose a system wherein the wireless access point is to train at least one channel for at least some of a plurality of stations associated with the plurality of SDMA data streams (See in Shattil'027 the training sequence in paragraph 55)

12. **Claim 41** is rejected under 35 U.S.C. 103(a) as being unpatentable over Perahia'718 in view of Shattil'027 and Priotti'410 as applied to claims 27 and 40 above respectively, and further in view of Shatil (US Pub.No. 2002/0150070 A1).

.

Regarding **claim 41**, the combination of Perahia'718, Shattil'027 and Priotti'410 fails to disclose an apparatus where the separation module comprises: a spatial demultiplexer to provide the separated plurality of data streams.

However, the above mentioned claimed limitations are well known in the art as evidenced by Shattil'897. In particular, Shattil'897 discloses an apparatus where the separation module comprises: a spatial demultiplexer **(Figure 2, element 206)** to provide the separated plurality of data streams **(Figure 2, element 206 is a frequency demapper and see also paragraphs 50 and 53 detailing how Figure 2, element 206 serves as a spatial demux)**.

In view of the above, having the apparatus based on the combination of Perahia'718, Shattil'027 and Priotti'410 and then given the well established teaching of Shattil'070, it would have been obvious to one having ordinary skill in the art at the time of the invention was made to modify the apparatus based on the combination of Perahia'718, Shattil'027 and Priotti'410 as taught by Shattil'070, since Shattil'070 clearly states in paragraph 50, that the use a spatial demultiplexer is to separate a particular signal from the interfering N-1 signals in the frequency domain.

Conclusion

13. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of

the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to HABTE MERED whose telephone number is (571)272-6046. The examiner can normally be reached on Monday to Friday 10:30AM to 7:00PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Aung S. Moe can be reached on 571 272 7314. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Aung S. Moe/
Supervisory Patent Examiner, Art Unit 2474

/Habte Mered/
Examiner, Art Unit 2474